Lesson 2: Human Impact on the deep-sea

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**Overview:**  In the previous lesson students were introduced to the importance of plankton to the survival of deep sea organisms. In this lesson they will understand the importance of plankton in carbon cycling and the effects of global warming. They will also study the loss of equilibrium that occurs with removal of a predator or producer. They will consider why humans threaten the equilibrium and propose a possible solution.

**Standards:**

* LS3 (9-11) -8a Students demonstrate an understanding of Natural selection/evolution by illustrating that when an environment changes, the survival advantage/disadvantage of some characteristics may change.
* LS2 (9-11) -4: Student demonstrate an understanding of matter and energy flow in an ecosystem by explaining how the chemical elements and compounds that make up living things pass through food webs and are combined and recombined in different ways.
* LS2 (9-11) -3: Students demonstrate an understanding of equilibrium in an ecosystem by describing ways in which humans can modify ecosystems and describe and predict the potential impact.
* LS2 (Ext)-3bb Students demonstrate an understanding of equilibrium in an ecosystem by researching and citing evidence of global warming to describe the potential impact on both the living and physical systems on Earth.
* Reading Standard for Literacy in Science (9-10) #2: Determine the central ideas or conclusions of a text; trace the text’s explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

**Objectives:**

1. Students will be able to draw the carbon cycle from the atmosphere and into the ocean.
2. Students will be able to explain the term “carbon sink”
3. Students will be able to explain how increasing ocean temperatures from global warming can affect the biodiversity of the entire ocean by relating it to energy flow and loss of producers.
4. Students will explain how removing a predator can affect equilibrium.
5. Students will be able to explain how some organisms benefit from human impact.
6. Students will write a letter to communicate facts about a human impact that threatens deep sea diversity.

**Materials/Preparation Notes**

* Photo from the movie *Avatar*
* Human impact: top and bottom graphic organizer sheet
* 25 Printed article (one for each student) : Threat 1: Overfishing from <http://saveourseas.com/threats/overfishing>.
* Jellyfish are taking over (NBS news clip): <http://www.nbcnews.com/video/nbc-news/24985937#53434425>
* <http://saveourseas.com/threats/predatorloss>
* Video of black tipped shark:

<http://www.arkive.org/blacktip-reef-shark/carcharhinus-melanopterus/video-00.html>

**Instruction:**

**Opening:** As students enter the room, have a photo from the movie *Avatar* on the screen. On the board write: What does the movie Avatar have to do with today’s lesson? Write your thoughts down.

Ask students to share their thoughts some possible ideas may be:

* All things are connected through carbon cycling
* Human impact can disrupt a balanced world
* James Cameron (director) used many ocean images to create his alien world
* James Cameron is an actual deep sea explorer!

Today we will be focusing on how equilibrium in the deep ocean can be affected by human impact at any level. We will start with the producer which is \_\_\_\_\_\_\_\_\_\_\_?

**Activities:**

**1.** Students will review and check their homework phytoplankton pages.

* Have each student trade homework with a student next to them.
* The peer will correct homework with a red pen as answers are reviewed in whole class.
* Pass homework back to original student to put in binder.

**2.** Discuss and have students draw the ocean carbon cycle on paper to put in binder.

**3.** Students will fill out the first half of Human Impact fact sheets during class discussion and pair share.

* Pass out the human impact worksheet
* Have a blank example on board/overhead/screen that teacher will fill in
* The first half of the column is related to what we know about plankton: what is the human impact that threatens plankton? (Global warming and loss of upwelling). What are facts that we know about the effect of global warming and plankton and why this is bad? Turn and talk to a partner about why we have global warming. After a few minutes have students share ideas then write several under “why it is happening” column. Now turn and talk to another partner about what you think could be done to help stop this effect. After a few minutes have students share ideas and write several in column.

**4**. We have a pretty good understanding of the effect of the loss of a primary producer. Let’s consider human impact on another level.

* Show shark video clip (2 min)
* Sharks are an apex predator.(what do you think apex means). Do any of you think that losing a predator will affect equilibrium in the deep sea? How?
* Discuss how loss of a predator allows other species (prey) to expand and then affect the level below it. Use the example of the loss of scallop industry in NC (from saveourseas.com) to illustrate.

**5**. Students will read printed article to find facts to complete the human impact fact sheet.

* Explain that for homework they will be using the facts on their sheets to write a letter to someone (editor, congressman, the president...) to encourage change and prevent the loss of either producer or predator in the ocean. The letter must include three facts about human impact. It must also state why humans have allowed the impact and provide one possible solution
* Pass out the printed sheets of “Threat 1: Overfishing” from <http://saveourseas.com/threats/overfishing>.
* Have students read silently alone and underline facts that will help them complete the worksheet. After they are done they may work quietly with a partner to complete the predator row.
* Teacher walks around during activity to ensure that students are discussing the topic and filling in the graph.

**Closing:**

Tell students that some organisms are opportunists. They are able to take advantage of changes in the environment and thrive because the organisms around them are disappearing. What are some attributes that may help an organism thrive? Ask them if they can think of an organism that if benefiting from human impact. Hints:

* it has very few predators
* it can survive in low oxygen
* It is not used by man
* It is a voracious eater of plankton

Let’s see if you are right

* (Don’t tell) Show jellyfish clip. <http://www.nbcnews.com/video/nbc-news/24985937#53434425>

**Assessment Notes:**

Student understanding will be assessed through grading the worksheets for completeness. Their homework letter will also be graded as a quiz grade. The main concepts from this lesson will be included in the final assessment.